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CLAIMS: Add A2 /

semiconductor articles, comprising:

an enclosure for providing a substantially enclosed work space;

- an interface port in said enclosure through which wafers are moved relative to said work space;
- a docking station which is controllable to open and close the interface port, said docking station having features for receiving a wafer container in position for moving wafers between the wafer container and work space;
- a plurality of processing stations; said processing stations having access openings which open to the work space to allow installation and removal of wafers relative to said processing stations;
- a conveyor for conveying wafers to and from said plurality of processing stations.
- A semiconductor processor according to claim 1 and further comprising a docking station relay for moving wafers between said docking station and said work space.

docking station relay is pivotable.

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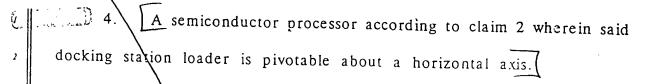
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- docking station forms an air lock when a wafer container is in an engaged position therewith.
- 6. A semiconductor processor according to claim 1 and further comprising a wafer transfer for transferring wafers from a wafer carrier to a wafer tray.
- A semiconductor processor acsording to claim 6 and further comprising at least one wafer tray which holds wafers in exposed positions for processing fluid access to the surfaces of the wafers.
- 8. A semiconductor processor according to claim 6 wherein said wafer transfer includes a first carriage which is movable.
- 9. A semiconductor processor according to claim 6 wherein said wafer transfer includes a first carriage which is movable; said first carriage having a transfer opening through which a wafer tray is elevated to remove wafers from the wafer carrier.

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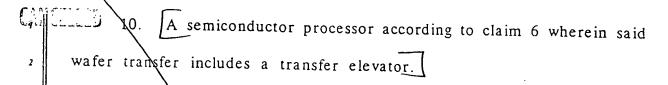
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wafer transfer includes:

- a first carriage which is movable; said first carriage having a transfer opening through which a wafer tray is elevated to remove wafers from the wafer carrier;
 - a transfer elevator.
- 12. A semiconductor processor according to claim 6 and further comprising a loaded tray holding station for holding wafer trays which are loaded with wafers.
- 13. A semiconductor processor according to claim 6 and further comprising a movable first carriage and a movable second carriage

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Amount 14. A semiconductor processor according to claim 6 and further comprising:

a movable first carriage; said first carriage forming part of said interface; said first carriage having a transfer opening through which a wafer tray is elevated to remove wafers from the wafer carrier;

a movable second carriage; said second carriage having a loaded tray holding station for holding wafer trays which are loaded with wafers;

a transfer elevator for moving the wafer tray through the transfer opening and wafer carrier to transfer wafers onto the wafer tray.

comprising:

a movable first carriage; said first carriage forming part of said interface; said first carriage having a transfer opening through which a wafer tray is elevated to remove wafers from the wafer carrier; said first carriage further having an empty tray pass-through opening through which an empty wafer tray is lowered by said elevator;

a movable second carriage; said second carriage having a loaded tray holding station for holding wafer trays which are loaded with wafers;

a transfer elevator for moving the wafer tray through the transfer opening and wafer carrier to transfer wafers onto the wafer tray

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16. A semiconductor processor according to claim 6 and further comprising: 2 a movable first carriage; said first carriage forming part of said 3 interface; a transfer opening through said first carriage and through which 5 a wafer tray is elevated to remove wafers from the wafer carrier; E an empty tray pass-through opening in said first carriage through 7 which an empty wafer tray is lowered by said elevator; 8 empty wafer tray storage for holding empty wafer trays; 9 a ... iovable second carriage; said second carriage having a loaded 10 tray holding station for holding wafer trays which are loaded with 11 wafers: 12 a transfer elevator for moving the wafer tray through the transfer 13 opening and wafer carrier to transfer wafers onto the wafer tray. 14 MOTING 17. A semiconductor processor according to claim 6 and further or 16 comprising a transfer elevator having an enlarged elevator head and a 17 relatively narrow elevator stem. 18 MELLED 18. | A semiconductor processor according to claim 1 wherein said

engages a wafer tray.

conveyor includes a mechanical arm assembly with a hand portion that

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NCELLED 9.	\sqrt{A} sem	ico	nductor proc	essor	according t	o clai	m 1 wherein	said
	\	a	mechanical	arm	assembly;	said	mechanical	arm
assembly	having:							

- an upper arm portion;
- a lower arm portion connected to the upper arm portion;
- a hand portion connected to the lower arm portion, said hand portion serving to engage a wafer tray.
- 20. A semiconductor processor according to claim 1 wherein said conveyor includes a conveyor tram carriage movably mounted upon the frame.

Conveyor includes a mechanical arm assembly; said mechanical arm assembly having:

- a conveyor tram carriage movably mounted upon the frame; an upper arm portion mounted upon said conveyor tram carriage for pivotal motion at a shoulder pivot;
 - a lower arm portion connected to the upper arm portion for pivotal motion at an elbow pivot;
 - a hand portion connected to the lower arm portion for pivotal motion at a wrist pivot;
 - a wafer tray engagement tool connected to the hand portion.

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plurality of processing stations includes at least one centrifugal processing station.

plurality of processing stations includes at least one centrifugal processing station having an access opening with a processing closure mounted to controllably open and close the access opening.

24. A semiconductor processor according to claim 1 wherein said plurality of processing stations includes at least one processing station having an access opening with a processing closure mounted for controlled upward and downward action; said processing closure serving to controllably close and open the access opening.

Plurality of processing stations includes at least one centrifugal processing station having an access opening with a processing closure mounted for controlled upward and downward action; said processing closure serving to controllably close and open the access opening.

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an enclosed wafer container, comprising:

an enclosure for providing a substantially enclosed work space;

an interface port in said enclosure through which wafers are moved relative to said work space;

a docking station which is controllable to open and close the interface port, said docking station having features for receiving said wafer container in position for moving wafers between the wafer container and work space;

a docking station relay for moving wafers between said docking station and said work space.

said docking station relay is pivotable.

28. A semiconductor processor according to claim 26 wherein said docking station loader is pivotable about a horizontal axis.

said docking station forms an air lock when a wafer container is in an engaged position therewith.

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MELLED 30.	A	semiconduc	tor process	sor a	ccording	to clair	n 26	and fur	ther
comprising	at	least one	inventory	for	holding				
movement	by	said dockir	ng station	rela <u>j</u>					

31. A semiconductor processor according to claim 26 and further comprising a wafer transfer for transferring wafers from a wafer carrier to a wafer tray.

said wafer transfer includes a first carriage which is movable.

said wafer transfer includes a first carriage which is movable; said first carriage having a transfer opening through which a wafer tray is elevated to remove wafers from the wafer carrier.

said wafer transfer includes a transfer elevator.

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said water transfer includes:

- a first carriage which is movable; said first carriage having a transfer opening through which a wafer tray is elevated to remove wafers from the wafer carrier;
 - a transfer elevator.

N(FLED36. A semiconductor processor according to claim 31 and further comprising a loaded tray holding station for holding wafer trays which are loaded with wafers.

comprising a movable first carriage and a movable second carriage.

comprising:

- a movable first carriage; said first carriage forming part of said interface; said first carriage having a transfer opening through which a wafer tray is elevated to remove wafers from the wafer carrier;
- a movable second carriage; said second carriage having a loaded tray holding station for holding wafer trays which are loaded with wafers;
- a transfer elevator for moving the wafer tray through the transfer opening and wafer carrier to transfer wafers onto the wafer tray.

comprising:

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a movable first carriage; said first carriage forming part of said
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interface; said first carriage having a transfer opening through which a
wafer tray is elevated to remove wafers from the wafer carrier; said
first carriage further having an empty tray pass-through opening through
which an empty water tray is lowered by said elevator;

A semiconductor processor according to claim 31 and further

a movable second carriage; said second carriage having a loaded tray holding station for holding wafer trays which are loaded with wafers;

a transfer elevator for moving the wafer tray through the transfer opening and wafer carrier to transfer wafers onto the wafer tray.

said transfer elevator has an enlarged elevator head and a relatively narrow elevator stem.

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A method for processing wafers and similar semiconductor articles using an automated semiconductor processing system, comprising: providing a substantially enclosed working space processing system enclosure forming a part of said semiconductor processing system;

engaging a sealed wafer container with a docking station forming a part of said semiconductor processing system;

opening the sealed wafer container; said opening occurring with the sealed wafer container in Auid communication with a contained area forming part of the wafer processing system;

opening an interface port forming a part of said docking station, through which wafers can be moved between the docking station and the enclosed work space;

moving wafers between the sealed \ wafer container and the enclosed work space;

relaying the wafers from the docking station to a transfer apparatus within the semiconductor processing system;

transferring wafers from a wafer carrier to a wafer tray suitable for subsequent processing;

processing wafers held upon a wafer tray through multiple processing stations.

A method for processing wafers according to claim 41 wherein aid transferring wafers includes: 2 positioning the wafer carrier containing the wafers; 3 extending the wafer tray through the wafer carrier; shifting wafers from the wafer carrier onto the wafer tray. 5 б A method for processing wafers according to claim 51 wherein said transferring wafers includes: 8 positioning the wafer carrier containing the wafers; 9 extending the wafer tray up through the wafer carrier; 10 lifting wafers from the wafer carrier onto the wafer tray. 11 12 (FILED 44.) A method for processing wafers according to claim 41 and further comprising placing a loaded wafer tray at a loaded tray holding station. 15 16 A method for processing wafers according to claim 41 and further comprising storing unloaded wafer trays within the enclosed work 18 space for use in said transferring wafers. 19 20 A method for processing wafers adcording to claim 41 and further comprising moving a first carriage from a carrier load position 22 to a transfer position. 23

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47. A method for processing wafers according to claim 41 and further comprising:

storing unloaded wafer trays upon a first carriage for use in said transferring wafers;

moving the first carriage from a carrier load position to a tray pick position;

elevating a stored unloaded wafer tray from the first carriage; moving the first carriage from the tray pick position to a transfer

position wherein said first carriage is ready for said transferring.

48. A method for processing wafers according to claim 41 and further comprising:

storing unloaded wafer trays upon a first carriage for use in said transferring wafers;

moving the first carriage from a carrier load position to a tray pick position;

elevating a stored unloaded wafer tray from the first carriage onto an elevator;

moving the first carriage from the tray pick position to a pass-through position;

lowering a wafer tray on said elevator through a pass-through opening in the first carriage;

moving the first carriage from the pass-through position to a transfer position wherein said first carriage is ready for said transferring.



CANCELLED 49. A method for processing wafers according to claim 41 and further comprising:

after said transferring wafers, moving a second carriage to an extended tray load position;

placing the loaded wafer tray at a loaded tray holding station upon said second carriage

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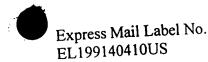
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further comprising:

storing unloaded wafer trays upon a first carriage for use in said transferring wafers;

moving the first carriage from a carrier load position to a tray pick position;

elevating a stored unloaded wafer tray from the first carriage onto an elevator;

moving the first carriage from the tray pick position to a passthrough position;

lowering a wafer tray on said elevator through a pass-through opening in the first carriage;

moving the first carriage from the pass-through position to a transfer position wherein said first carriage is ready for said transferring; after said transferring wafers, moving a second carriage to an extended tray load position;

placing the loaded wafer tray at a loaded tray holding station upon said second carriage.

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A method for processing wafers and similar semiconductor articles using an automated semiconductor processing system, comprising:

providing a substantially enclosed working space within a processing system enclosure forming a part of said semiconductor processing system;

engaging a sealed wafer container with a dashing state of said.

engaging a sealed wafer container with a docking station forming a part of said semiconductor processing system;

opening the sealed wafer container; said opening occurring with the sealed wafer container in fluid communication with a contained area forming part of the wafer processing system;

opening an interface port forming a part of said docking station, through which wafers can be moved between the docking station and the enclosed work space;

moving wafers between the sealed wafer container and the enclosed work space;

relaying the wafers from the docking station to another position within the processing enclosure.

wherein said relaying includes pivoting the wafers from the docking station.

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53. A method for processing wafers according to claim 51 wherein said relaying includes pivoting the wafers from the docking station about a horizontal pivot axis.

wherein said relaying includes pivoting the wafers from the docking station and resting the wafers upon a movable carriage.

wherein said relaying includes pivoting the wafers from the docking station and resting the wafers upon a movable carriage in an orientation displaced approximately 90°.

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